Validation of the Chinese Version of the Problem Areas in Diabetes (PAID-C) Scale

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OBJECTIVE — To examine the psychometric properties of a Chinese version of the Problem Areas In Diabetes (PAID-C) scale.

RESEARCH DESIGN AND METHODS — The reliability and validity of the PAID-C were evaluated in a convenience sample of 205 outpatients with type 2 diabetes. Confirmatory factor analysis, Bland-Altman analysis, and Spearman's correlations facilitated the psychometric evaluation.

RESULTS — Confirmatory factor analysis confirmed a one-factor structure of the PAID-C (χ^2/df ratio = 1.894, goodness-of-fit index = 0.901, comparative fit index = 0.905, root mean square error of approximation = 0.066). The PAID-C was associated with A1C ($r_s = 0.15$; $P < 0.05$) and diabetes self-care behaviors in general diet ($r_s = -0.17$; $P < 0.05$) and exercise ($r_s = -0.17$; $P < 0.05$). The 4-week test-retest reliability demonstrated satisfactory stability ($r_s = 0.83$; $P < 0.01$).

CONCLUSIONS — The PAID-C is a reliable and valid measure to determine diabetes-related emotional distress in Chinese people with type 2 diabetes.

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The Problem Areas In Diabetes (PAID) scale is a diabetes-specific instrument that measures changes in psychosocial and emotional states associated with diabetes (1). This scale has been previously translated into various languages and is widely used in research and clinical practice (2,3). However, no international published data are currently available on this instrument for the Chinese population. The aim of the present study was to examine the psychometric properties of a Chinese version of the PAID (PAID-C) scale.

RESEARCH DESIGN AND METHODS

— PAID was translated into a Chinese version guided by the Brislin's translation model (4,5) (see Table S1, found in an online appendix at http://care.diabetesjournals.org/cgi/content/full/dc09-0768/DC1). After finishing the translation procedure, psychometric examination of PAID-C was subsequently undertaken. Participants were recruited from the endocrine outpatient departments of three hospitals in Taiwan. People with type 2 diabetes aged ≥40 years, diagnosed with type 2 diabetes at least 6 months and living at home, were included. A recent value of A1C collected within the past 3 months through the medical records and the Summary of Diabetes Self-Care Activities scale (6) were used to examine criterion validity of the PAID-C. The institutional review boards of three participating hospitals approved the study protocol. All participants provided written consent.

Statistical analyses were performed using AMOS (version 16.0) and SPSS (version 15.0). Confirmatory factor analysis (CFA) was conducted to examine the construct validity of the PAID-C. Criterion validity and test-retest reliability of the instrument were examined using Spearman correlations (7). Bland-Altman plots were also generated to facilitate the evaluation of test-retest reliability (8).

RESULTS

— A total of 205 people with type 2 diabetes participated in this study. The sample comprised 61.5% (n = 126) men and 38.5% (n = 79) women. The mean age was 60.4 ± 10.4 years (mean ± SD), and the mean duration since diagnosis of diabetes was 8.1 ± 7.6 years. Average A1C value was 8.7 ± 1.9%. A total of 35 participants were randomly selected from the total sample to examine the test-retest reliability.

The mean value for the PAID-C was 10.95 ± 13.06, ranging from 0 to 73.75. The highest scoring item was item 12, "Worrying about the future and the possibility of serious complications" (1.21 ± 1.23), while the lowest scoring item was item 15, "Feeling unsatisfied with your diabetes physician" (0.04 ± 0.27).

Construct validity of the PAID-C was evaluated using CFA. Fit estimates for a one-factor model based on the original version of the PAID were good: $\chi^2_{(163)}$ = 308.755 ($P < 0.01$), χ^2/df ratio = 1.894, goodness-of-fit index = 0.901, comparative fit index = 0.905, root mean square error of approximation = 0.066 (95% CI 0.055–0.077). All items were significantly loaded on the construct of diabetes-related distress ranging from 0.24 to 0.72 ($P < 0.01$).

The PAID-C was positively associated with A1C ($r_s = 0.15$; $P < 0.05$), indicating that higher levels of diabetes-related distress were related to poorer glycemic control. In addition, the PAID-C was negatively associated with diabetes self-care behaviors in general diet ($r_s = -0.17$; $P < 0.05$) and exercise ($r_s = -0.17$; $P < 0.05$) as measured with the Summary of Diabetes Self-Care Activities scale. That is,

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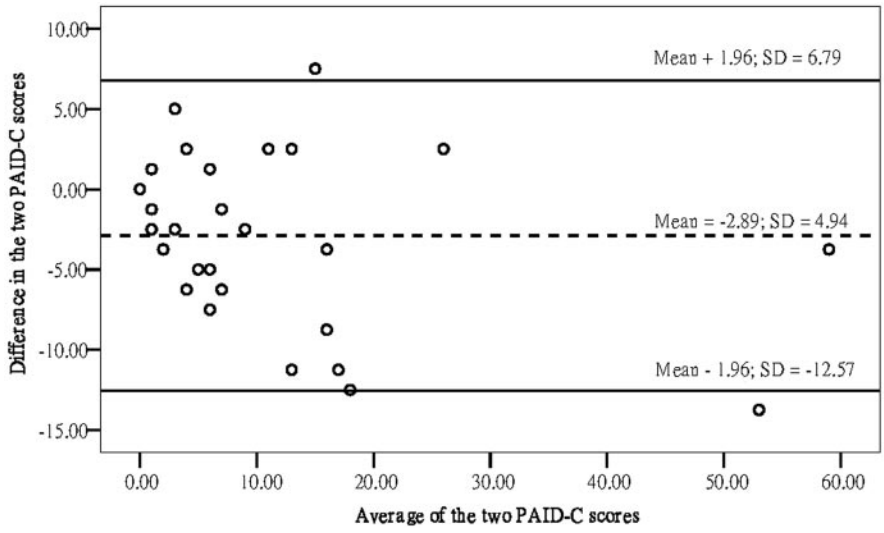

Figure 1—*Bland-Altman plots for test-retest reliability of the PAID-C. The* y*-axis represents the difference between the first-week total score and the fourth-week total score. The* x*-axis represents the average of the first-week total score and the fourth-week total score.*

higher scores on the PAID-C were related to poorer dietary control and a lack of exercise.

The 4-week test-retest reliability of the PAID-C was satisfactory ($r_s = 0.83$, $P < 0.01$). Bland-Altman plots also illustrated satisfactory test-retest agreement of the PAID-C, with limits of the agreement (central 95% of discrepancies) ranging from −12.57 to 6.79. The plot shows 94% (33/35) of participants were within the limits of agreement (Fig. 1).

CONCLUSIONS — This is the first study to evaluate the psychometric properties of the PAID scale in the Chinese population. Confirmatory factor analyses revealed a one-factor solution of the PAID-C that fitted the original version of the PAID, suggesting satisfactory construct validity of the PAID-C. Factor structures of the PAID had previously been examined using different approaches in various populations. For instance, a Dutch study using the principal component factor analysis with oblimin rotation found the PAID items fitted a proposed four-factor model better than the original one-factor model (2). Two factors were extracted in the Icelandic PAID using the principal component factor analysis with varimax rotation (3). These inconsistent results could be related to the use of exploratory factor analysis.

Factor analysis is a useful technique to assess construct validity of an established instrument when administered to a specific population; however, the CFA and exploratory factor analysis are used for different purposes (9). The CFA can be used to measure the underlying dimensions of a construct identified through exploratory factor analysis and to compare factor structures across studies (9). In contrast, when researchers do not know how many factors are necessary to explain the interrelationships among a set of indicators or items, an exploratory factor analysis approach is the suggested method (9,10). Thus, the present study used the more relevant method, i.e., CFA, to evaluate the construct validity of the PAID-C.

Our study showed a positive relationship between diabetes-related emotional distress and glycemic control and a negative association with diabetes self-care behaviors. Although mild, the pattern of correlations is similar to results of a previous study showing that diabetes-related emotional distress was positively correlated with A1C levels and negatively associated with dietary self-care behaviors (11). Likewise, the Dutch PAID presented a mild association with A1C levels ($r = 0.11$, $P < 0.01$) (2). These results supported acceptable criterion validity of the PAID-C.

Our findings revealed the test-retest coefficient was high enough to support the stability of the PAID-C. This result resembled the findings of the Dutch PAID for a 2-month test-retest reliability ($r = 0.83$) (2). The Bland-Altman plot also illustrated satisfactory agreement between individuals over a 4-week period.

In conclusion, psychometric properties of the PAID-C demonstrated satisfactory validity and reliability. The PAID-C is a reliable and valid measure to determine diabetes-related emotional distress in Chinese populations with type 2 diabetes.

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